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# Pediatric CT Dose Estimation (Simple Model)
# You can run this cell directly in Jupyter Notebook

# --- Input Section ---
age = 5                    # patient age in years
region = "abdomen"         # choose: "head", "chest", or "abdomen"
ctdi_vol = 20              # CTDIvol value in mGy
dlp = 300                  # DLP value in mGy·cm

# --- Dose Calculation ---
# Pediatric size conversion factors (AAPM Report 204)
ssde_factors = {
    "head": 1.0,
    "chest": 1.2,
    "abdomen": 1.15
}

# DLP-to-Effective Dose Conversion Factors (mSv/mGy·cm)
k_factors = {
    "head": 0.0021,
    "chest": 0.018,
    "abdomen": 0.020
}

# Select factors
ssde_factor = ssde_factors.get(region.lower(), 1.0)
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k_factor = k_factors.get(region.lower(), 0.02)

# Compute Size-Specific Dose Estimate (SSDE)
ssde = ctdi_vol * ssde_factor

# Compute Effective Dose (mSv)
effective_dose = dlp * k_factor

# Simplified organ dose estimation (relative fractions)
organ_fractions = {
    "head": {"brain": 1.0},
    "chest": {"lungs": 1.0, "heart": 0.8},
    "abdomen": {"liver": 1.0, "kidneys": 0.8, "stomach": 0.7}
}

organ_doses = {}
for organ, fraction in organ_fractions.get(region.lower(), {}).items():
    organ_doses[organ] = ssde * fraction

# --- Output Results ---
print("=== Pediatric CT Dose Estimation ===")
print(f"Patient age: {age} years")
print(f"Region: {region.capitalize()}")
print(f"CTDIvol: {ctdi_vol} mGy")
print(f"DLP: {dlp} mGy·cm")
print(f"SSDE: {ssde:.2f} mGy")
```

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print(f"Estimated Effective Dose: {effective_dose:.2f} mSv")

print("\nOrgan Doses (approx.):")

for organ, dose in organ_doses.items():

    print(f"  {organ.capitalize()}: {dose:.2f} mGy")
```